

Introduction to Biology. Lecture 17

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October 8, 2012

Outline

- 1 Questions and answers
 - Exam 2
 - Nucleus, intrones and telomerase
 - Where we are?
- 2 Cambrian period
 - Life in Cambrian

Outline

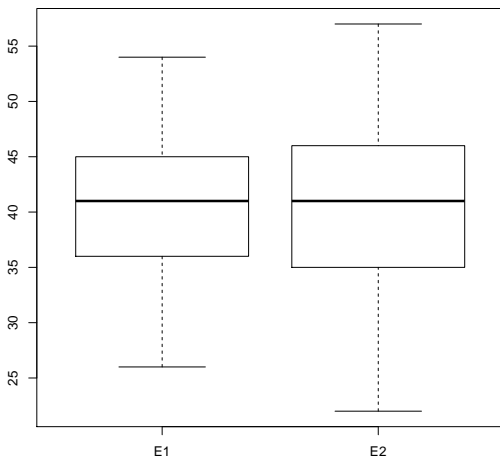
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Questions and answers

Exam 2

Exam 1 *versus* Exam 2



Results of Exam 2: statistic summary

Summary:

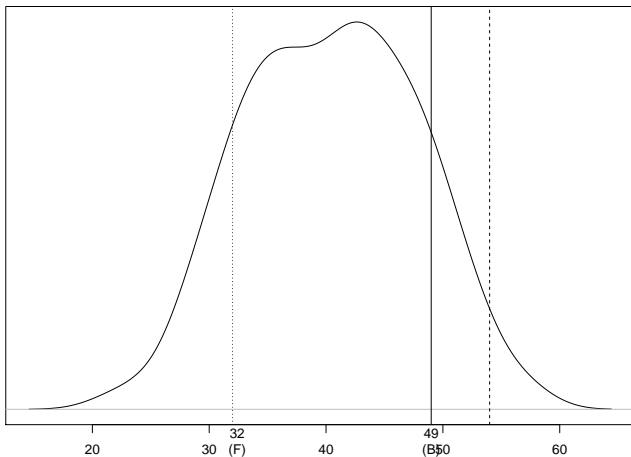
| Min. | 1st Qu. | Median | Mean | 3rd Qu. | Max. | NA' s |
|-------|---------|--------|-------|---------|-------|-------|
| 22.00 | 35.00 | 41.00 | 40.44 | 46.00 | 57.00 | 11 |

Grades:

| F | D | C | B | max |
|----|----|----|----|-----|
| 32 | 38 | 43 | 49 | 54 |

Results of Exam 2: the curve

Density estimation for Exam 2 (Biol 111)

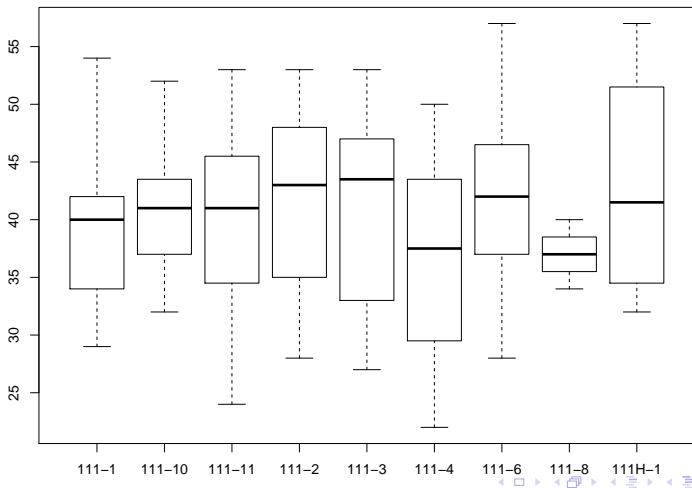


Points



Results of Exam 2: sections

Competition between Biol 111 sections (Exam 2)

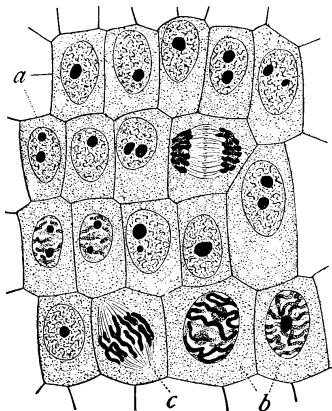


Results of Exam 2: some questions I

- To make lipids from carbohydrates, plants need:
 - Ⓐ **To recombine atoms in molecule**
 - Ⓑ To add phosphorous
 - Ⓒ To add phosphorous and nitrogen
- On photosynthesis lab, we used water contained sodium hydrocarbonate, NaHCO_3 . Why?
 - Ⓐ **It takes CO_2 produced during artificial “night”**
 - Ⓑ It takes O_2 produced during artificial “night”
 - Ⓒ It produce an additional CO_2 needed for photosynthesis
- How to obtain monomers for the body construction?
 - Ⓐ Digestion
 - Ⓑ Photosynthesis
 - Ⓒ **Both of above**



Results of Exam 2: cell division question



- Which stages are representing by cells *a*, *b*, *c*, respectively?
 - **A** Interphase, prophase, anaphase
 - **B** Prophase, metaphase, anaphase
 - **C** Telophase, anaphase, prophase

Results of Exam 2: some questions II

- Imagine “protein” of only two amino acids, leucine (triplet UUA) and alanine (triplet GCG). Which of following is its gene?
 - Ⓐ UUAGCG
 - Ⓑ AAUCGC
 - Ⓒ **AATCGC**
- Which of the following were multi-tissued?
 - Ⓐ Lantian algae
 - Ⓑ **Ediacarian worms**
 - Ⓒ Proterozoic acritarchs
- Nucleus:
 - Ⓐ **Defends from viruses**
 - Ⓑ Contains no RNA
 - Ⓒ Both of above

Questions and answers

Nucleus, intrones and telomerase

The logic of acquiring nucleus

- In bacterial mat, many bacterial groups coexist
- Due to the evolution, they become more and more dissimilar
- However, **horizontal transfer** of DNA continued
- To prevent the transfer of alien genes, some cells “decided” to separate DNA with membranes

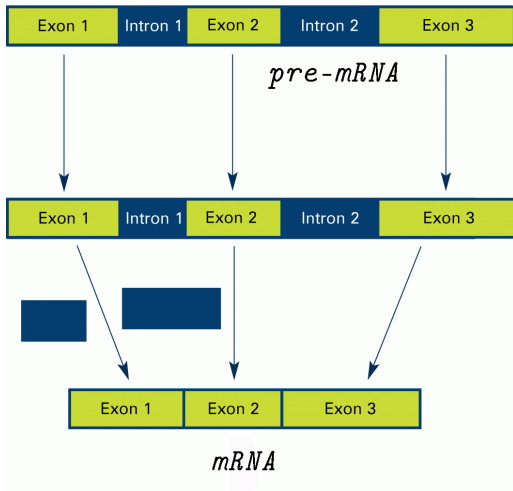
Nuclear envelope

- There are many ways to create nucleus-like structures. For example, it could be guarded with one membrane but then pores will be impossible
- Eukaryote ancestors created the *nuclear envelope from ER*

Introns

- Creating a nucleus run the cascade of consequences. First of all, cell now may keep much more DNA
- Some of this DNA may now contain insertions—**introns** which are removed before mRNA go through the nuclear pore
- Introns increase the variability of DNA and allow to make many variants of proteins

Introns and exons



Only archebacteria and eukaryotes have introns

Linear DNA

- Circular molecules of DNA are harder to keep, difficult to enlarge and slower to duplicate
- Eukaryotes change circular DNA into linear
- Every linear DNA molecule is “I-chromosome”

Telomerase and aging

- Unfortunately, replication of linear DNA has a problem: with every replication, the very end of DNA molecule *is not replicated*
- **Telomerase** adds some nonsense DNA to the telomere and thus prevent the shortening of DNA molecule
- Unfortunately, sometimes telomerase is not working well and DNA was cut... This is one of main reasons of **aging**

Telomere replication and telomerase

[Please ignore unknown terms]

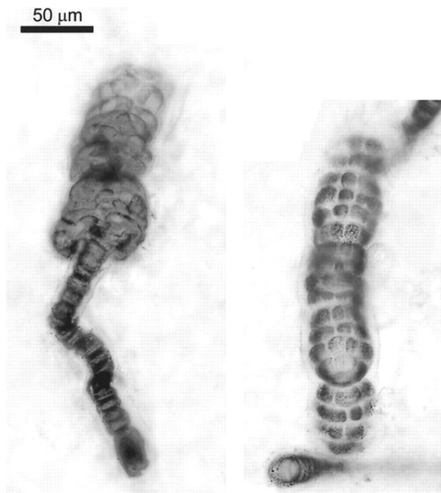
Questions and answers

Where we are?

Precambrian life

- In Cryogenian, Marinoan glaciation covered the whole Earth
- In Ediacarian, multicellular and then multi-tissued eukaryotes appeared

One of first multicellular alga with reproductive cells



Bangiomorpha, putative red alga from Proterozoic

Cambrian period

Life in Cambrian

Timescale of Phanerozoic eon, Paleozoic era

- Phanerozoic eon
 - Paleozoic era
 - Cambrian period: 541 Mya
 - Ordovician period: 485 Mya
 - Silurian period: 443 Mya
 - Devonian period: 419 Mya
 - Carboniferous period: 358 Mya
 - Permian period: 299–252 Mya

Summary

- Introns, linear DNA molecules and telomere/telomerase system differ eukaryotes from most prokaryotes

For Further Reading



Introns.

<http://en.wikipedia.org/wiki/Intron>